NEW TECHNIQUE IN THE SURGICAL TREATMENT OF SEVERE AND PROGRESSIVE DEAFNESS FROM OTOSCLEROSIS*

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In beginning this address, I should like first of all to express my gratitude to Dr. Fowler for the honor of being asked by him to give you my opinion on one of the most difficult and arduous problems in our specialty. I should also like to express to him, and all of you, who saw service in France, my great appreciation for the sympathy that was shown to the Country to which you came to succour in a time of great distress. You abandoned your firesides, your occupations and your interests; that is a thing which a Frenchman cannot forget, and that he likes to recall.

I wish also associated with this great honor to me, the names of some of the masters to whom I am indebted for what I have been able to do: Lermoyez and Henri Bourgeois, of Paris, for general culture, and to Professors Bárány of Upsala and Gunar Holmgren of Stockholm for the particular question that brings us together tonight: The surgical treatment of otosclerosis.

I regret very much not having enough command of your language to go as much into the details as I should like to in discussing such a subject. I am sure you will excuse the way my subject is presented and take away only the point of what is said, not how it is said.

The surgical treatment of otosclerosis, begun twenty-five years ago by Professor Bárány, Doctor Jenkins and Professor Holmgren, has received in the past ten years such an impetus that it has become one of the most captivating subjects in contemporary otology, but also one of the most complex. It is not possible to treat it completely in a few moments. Besides, the late Dr. Duel and Dr.

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Fowler have set forth the general state of the whole question in the recently published third volume on otosclerosis. I wish therefore, this evening, after a rapid tour of the horizons, to show you more particularly my personal experiences, what seems to me to be to the point—what it is already possible to do.

In a general way, it is possible to group the operative procedures by various authors, who have tackled this question, into two large groups. The first comprises the procedures which have been inspired by the presumed pathogenesis of otosclerosis. They propose to attack the disease at its root and the operations are performed outside of, or even far from the ear. These are:

1. The operation of Wittmaack-Heyninz-Rollin, designed to combat the perilabyrinthine venous stasis. This operation may be called "elevation of the supra-tympanic dura mater." I hope that Dr. Fowler, Jr., who has just returned from Hamburg, will tell you something about it later.

2. The operation of Alonso-Chiarino, which consists in removing one parathyroid or suppressing its function by ligature of its principal vessels. The operation is recent and we cannot yet judge the results.

In every way these operations with a pathogenetic inspiration are designed with one purpose in mind: the arresting of the progress of the disease. But, supposing this final purpose obtained, it is not wholly a question of making the disease retrocede, nor of recovering a too deficient audition. They are therefore indicated only at the very beginning of the sickness and once the cases have passed the early stages, they should be put in the second category.

The second class of operation, comprising those which are properly auricular, attack the local functional troubles. They are based on the acoustic results produced by fenestration of the labyrinth. These are by far the most numerous. They are the newest and most fertile and give promise of being a definite triumph. It is these which I shall discuss for the rest of this conference.

I. Operations Based on Fenestration of the Labyrinth

Historical.

With what we know today, it is easy to understand why the first tentative surgical procedures which took place in the last century could not succeed—in particular those used towards 1890, the extraction of the stapes or the operation of Kessel. Here are two cases of the common lesions of otosclerosis. The footplate of the stapes is so fixed by an osseous process and its crura so wedged in by the borders of the deformed oval window that extraction of the ossicle is practically impossible. If one exerts traction on the crura they are certain to be fractured and there is no other way of raising the footplate. Besides, be assured that even if this could be done, the large communication established between the hole opened by the ablatum of the tympanus and the labyrinth will permit infection to enter and will thus lead to inevitable total deafness. It was this simple conception which led in 1900 to an official condemnation of the operation which was so severe that we are still influenced by it

When Bárány, in 1910, proposed the opening of the posterior semi-circular canal he had a double purpose:

1. Acoustic: to create a labyrinthine window which would compensate for the suppressed resonant waves, from which he hoped that the round window would then take over the function of the non-utilizable oval window.

2. Surgical: to avoid the opening of the mastoid cells and so avoid the mastoid infection and the secondary labyrinthitis, so much to be feared.

An immediate result was obtained: the return of audition on the operating table; but the result was ephemeral; for, a few days after the operation, the increase in hearing disappeared.

Doctor Jenkins and Professor Holmgren in opening the external and superior semi-circular canals had the same experience.

Since the gain in hearing appeared with the opening of the labyrinth, one can easily deduce that its disappearance

was due to a bony closure of the labyrinthine fistula. For fifteen years these authors tried to combat this bony closure of the fistula; they tried soft tissue; they used fat grafts. They used connective tissue grafts with and without prostheses. They used gutta percha.

On the other hand, each of these surgical procedures was attended by more or less complete or conservative radical operations. There was the greatest chance of a surrounding infection, extremely difficult to control, and often connecting with the labyrinth so as to destroy it.

So Bárány and Holmgren adopted the mastoid operation without opening of the external auditory meatus and with immediate closure of the retro-auricular wound.

When, in October 1924, I was introduced to this type of surgery by Prof. Holmgren, I quickly saw that there were two problems to be attacked: the acoustic and the surgical. But if the solution of the two problems was indispensable to obtain a result, the order of the researches was not an indifferent matter. I believe that in order to solve the acoustic problem, it was necessary to determine the mechanism of the return of hearing as well as finding the way of conserving it. The surgical problems would naturally follow and adapt themselves to the physiological conditions required. Experimentation has finally proved that there was a concordance with the pathological problem.

On these bases I created surgical procedures which I named "tympano-labyrinthopexy". They consist in associating the opening of the external semi-circular canal to the new tympanic system derived from the normal system. For the last ten years I have remained faithful to this principle; all my efforts, with the collaboration of my Assistant, Dr. André Loué, have been bent towards the realization of its technique. Two of my friends, Doctor Ledoux of Brussells and Dr. Tato of Buenos Aires, have been kind enough to follow me in this path. More recently, in 1936, Professor Holmgren has brought an important modification in his procedures, on the principle of his en-

domastoid operation, consisting in the simultaneous opening of two or three semi-circular canals and the application of a gold leaf between the labyrinthine fistula and the membranous cover.

In order to judge the value of these different procedures, let us study more in detail the problems to which they give birth.

II. The Acoustic Problem

A. *The mechanism of the return of hearing at the moment of the opening of the labyrinth*

From the opening of the semi-circular canal, that is, the perilymphatic space, *there is an outflow of perilymph.* Presently, but only after the passing of a moment, the hearing increases. Why? Professor Holmgren has said, "it is the decompression which does this," but what does he mean by that? Since the semi-circular canals are at different levels, on opening them, all the spaces above the level of the labyrinthine fistula *become empty.* Of course, the pressure is diminished. But in my opinion there is something else much more important. There is formed in the labyrinth *a free surface of perilymph.* The mobilization of this perilymph is therefore considerably augmented under the influence of a sound wave at the level of the opening of the labyrinth, not only by air conduction but also by bone conduction from the entire cranial vault.

It is then the *half-emptiness* of the perilymphatic space with the resultant very great mobility of the perilymph which is the cause of the increase in hearing. This is what I called at Norwich, England, *"the mechanism of the half-filled flask."*

It is in fact easy to reproduce this phenomenon with the aid of two flasks placed upon a table. One is full of water with its cork indicator submerged, and closed by a cork. The other is half full, but with the same cork indicator. The least shock given to the table puts the indicator of the half filled flask in vibration, while that of the completely filled flask rests immobile.

How is sound energy transmitted to the perilymph? At the same time, both by the direct influence on perilymph at the level of the labyrinthine fistula which is exposed to the exterior air and by bone conduction from

the cranium. Because it is manifest that if the labyrinth being open, on suturing the posterior mastoid wound and on closing the external auditory meatus with wax or paraffin, the auditory gain is diminished but the hearing still remains better than it was before the creation of the labyrinthine fistula. Also in the first hours that follow the opening of the labyrinth, the Weber is often lateralized to the side of the open labyrinth which indicates that the bone conduction has been increased on that side.

This mobility of the perilymph is still greater in the case of multiple simultaneous opening of either two, or even three semi-circular canals, as has been recently performed by Professor Holmgren. He has stated that at each new opening of a canal there is a corresponding increase in hearing which permits the patient to hear ten, fifteen or twenty times the distance that he could hear before the operation.

B. *Mechanism for the conservation of the improved hearing*

The first idea which comes to mind will be to conserve indefinitely this state of semi-vacuity of the labyrinth. But for that, it would be necessary to produce a *continual outflow* of perilymph in a quantity just equal to its relatively rapid rate of secretion.

Practically, the least membrane that one places on the labyrinthine fistula — a piece of connective tissue — the slightest clot of blood adheres rapidly to the bony edges and prevents the escape of the perilymph. The *labyrinth refills,* the pressure increases and the mobility of the perilymph diminishes; so does the increase in hearing. While the membrane over the opening remains thin, supple and easily depressable, the hearing continues to remain considerably increased; if this membrane becomes thickened or ossified, all the gain disappears.

But experience has shown that even with a refilled labyrinth *it is still possible to produce hearing by mobilizing the perilymph of this refilled labyrinth.* We are going to see how.

III. The Surgical Problem

The surgical problem presents itself under two headings:

1. By what mechanism can the mobilization of the perilymph be conserved in a durable way?

2. Can this hearing mechanism be practically produced surgically?

Hearing mechanism

a. *The continual escape of perilymph* seems to have been produced recently by Holmgren who placed a piece of gold foil over the labyrinthine fistula. The gold foil prevented the adherence of a fat graft to bony edges of fistula. Between the gold foil and the bone the perilymph could filter out. Evidently the adherence of the fat graft to the edges of the gold foil puts off the problem rather than solves it.

b. *The direct mobilization of the perilymph of a filled labyrinth* is possible. It is sufficient to place on the labyrinthine fistula, either directly or else with interposition of thin cushions of fat or connective tissue, a prosthesis of a certain weight, a foreign body such as a piece of gutta percha (Bárány, Holmgren). These masses in contact with the bony walls of the mastoid receive sound vibrations by bone conduction and are displaced by them. This movement induced at the level of the labyrinthine fistula produces little shocks which hit the perilymph and set it in motion. This is what I have called *the mechanism of the bell.*

c. *The indirect mobilization of the perilymph in a filled labyrinth can be produced by mobilization of the membrane covering the labyrinthine fistula by means of a reconstructed tympanic system.* This is the method which I have personally devised and have been using for the past ten years. I have given it the name "tympano-labyrinthopexy." It consists in joining the covering membranes of the labyrinthine fistula with the superior border of the membrana tympani whose excursions have been increased by the resection of the head of the malleus.

The incus preserved in its high position plays the rôle of a mobile prop and permits the displacement *en masse* of the entire system. The proof that this is the correct interpretation lies in the fact that immobilization of the incus or adherence of the flap between the drum and the labyrinthine fistula no longer permits the conservation of the hearing, which has been observed to be increased at the

operating table. I have tried to demonstrate this with a stroboscope. So far I have had no success, however.

IV. Surgical Results of These Diverse Procedures

A. In the two first procedures, utilizing the gold foil and prosthesis with gutta percha, the operation can be done simply enough in one sitting by the *endo-mastoid route* with immediate closure of the post-auricular wound. One thus avoids the danger of infection and recovery can be rapid, normally fifteen or twenty days. But against these advantages of which the most evident is the speed of recovery, one must put these inconveniences.

1. What is the value of the surgical result for this type of auditory mechanism?

I believe that I can truthfully say that the essential purpose of the prosthesis has always been, in the words of its authors, to prevent the closure of the bony fistula. Their action I believe to be very feeble. Actually the closure of the fistula is easier in these cases than without prosthesis.

I have already explained that actually the rôle of the prosthesis is not to keep the fistula open but to produce an auditory mechanism of its own. Unhappily this is the weak point of the procedure. The mechanism is artificial and very delicate. The secondary immobilization of the prosthesis or its isolation from bone by masses of granulation tissue, connective tissue grafts, or fibrous tissue, often supervenes and destroys rather rapidly its good effects.

2. After the mastoid wound is closed we no longer have any external control of the labyrinthine fistula or of the function of the prosthesis. If re-intervention is necessary, it must be done blindly and whatever modification or retouching is done, the same conditions return and again there is no progress.

3. Finally there remains the great uncertainty of the tolerance for a foreign body of an exact weight and an exact surface placed in contact with bone at the bottom

of a mastoid susceptible to direct infection in the course of the operation or later by way of the Eustachian tube and middle ear.

Besides, even in fracture repairs such foreign bodies produce such serious accidents that secondary ablations of them are often necessary. There are those who believe a foreign body may increase the susceptibility to infection of the labyrinth and through the labyrinth the meninges.

B. The tympano-labyrinthopexy has against it its complicated appearance and the difficulties of its realization.

Against it is to be noted:

1. It cannot be done in a single operation. It is necessary to have two or, better, three successive operations and frequently the third stage must be repeated in order to obtain a permanent labyrinthine fistula with a maximum effect.

2. It is an *extra-mastoid* operation, that is to say, it puts the interior of the mastoid cavity in communication with the cavity of the external auditory canal and so makes it susceptible to an external otitis. It is necessary to accept this risk, but at a moment when there is no danger to the labyrinth, with careful aseptic technique, this stumbling block can usually be avoided and in any case can be surmounted before the opening of the labyrinth.

Of its advantages we can say:

1. In case the transformation of the tympanic system is successfully carried out, its function is definitely assured without the possible variation of the type seen with the prosthesis.

2. The tympanic system and the labyrinthine fistula are constantly in sight and can be tested with a manometer or any other imaginable apparatus of control. This is very important.

3. With the tympano-labyrinthopexy, the opening of a *single canal* (the horizontal, the most easy of access) produces a considerable amelioriation of the auditory malfunction, from forty to fifty times or more the distance of the preoperative hearing. With the prosthesis procedures,

in order to get the best results it is necessary to open several semi-circular canals. This is one of the greatest objections that one could possibly make to operations in this category. Wounding of the membranous canal is one of the greatest dangers that one faces in the curing of deafness. The more osseous canals that are opened, the more the risk of injuring the membranous canals. It is better to concentrate on the less delicate manoeuvres on the tympanic system than on the labyrinth, which is so very fragile.

4. Biologically it is unnecessary to add any foreign body to the organism with the consequent danger of intolerance, or of labyrinthine suppuration and its propagation to the meninges.

5. Each difficulty is attacked separately and the results proved before passing to the next.

6. Touching up the operation is easy and is directed exactly at the point at fault. Most often it is the labyrinthine fistula which is closed by an osseous callus. Now the formation of this callus is the result of two elements: the ossification of the endosteum and the proliferation of the osseous surface. Practically it is very difficult in a single opening to raise the endosteum completely and prevent proliferation of the osseous surface. But if one lifts up this new-formed osseous lamella, one elevates at the same time both the ossified endosteum, and the osseous surface, cut in the callus, has less tendency to proliferate. Experience has shown that in most cases, the results are definite after this second opening of the labyrinth.

It is because of these advantages that I remain constantly faithful to this procedure, the nearest approach to the natural mechanisms of hearing. I prefer to adopt the most normal, the most sure and the least dangerous mechanisms, whatever the difficulties, even if certain material inconveniences have to be borne, to which conditions the surgical technique must submit. The three primary considerations are the safety of the patients, the regularity, and the quality of the end-results.

V. The Pathologic Problem

It is now an undeniably observed fact that a local surgical treatment is sufficient to re-establish hearing and to conserve it without change for several years, as long as the necessary conditions expressed above are adhered to. Doubts expressed on the durability of the results and the cessation of the evolution of the disease are no longer valid after eight years of observation.

How then can we make these results accord with the diverse known pathologic conceptions which are still in favor? Far be it from me to think of minimizing the importance of these histologic considerations. But alone they do not constitute the whole malady. There are perhaps elements that the microscope cannot show. It is necessary also, according to the ideas of Professor Leriche, to use the aids of clinical and operative physiology. Tympano-labyrinthopexy permits this being done.

It seems well established that the known osseous lesions do not act directly on the auditory elements but probably through the intermediary of the liquid media of the ear, in particular modifications of the perilymph.

Objectively any durable and permanent decompression of the perilymph suffices to arrest the progression of the deafness. What difference does the method make if the functional result is obtained? In our uncertainty, nothing can prevail against undeniably observed facts. But in order to improve the hearing, something more is necessary to reestablish the mobility of the perilymph by one of the described mechanisms.

In the present state of our knowledge, at least of mine, the procedures most direct and best worked out, and the one on which we have the most experimental data, is tympano-labyrinthopexy: the reconstruction of a secondary tympanic system associated to one labyrinthine fenestra. These two structures complete each other and are inseparable.

Operative Indications

Here it is necessary to consider three groups of facts: (1) *Nature and degree of the deafness;* (2) *Indications of primary otospongiosis,* hereditary or not, without middle ear inflammation but with fixation of the stapes which is diagnosed by the following acoustic methods: (a) raising of the lower tone limit from 32 to 128 double vibrations; (b) Rinne negative; (c) Schwabach prolonged; (d) Conservation of a certain degree of labyrinthine sensibility manifested by an audition consisting of between 50 cm. of whispered voice and 50 cm. of shouted voice with the opposite ear masked during the testing of the shouted voice.

Absolute deafness, or almost absolute, ought to be considered a contra-indication if one is going to conserve for this operative procedure its demonstrative value. However, I have found in some of these cases 30 to 40 cm. or perhaps one meter audition for the loud voice on opening of the labyrinth, particularly in young subjects, and when the bone conduction values are below normal. But if the Schwabach is much diminished there can be no perception of sound. In the first case, the advantage is considerable since the patient can again converse directly for short distances and indirectly, with a hearing aid for considerable distances. One should therefore not exclude these patients from a chance of recovery. They would choose it themselves.

CONTRA-INDICATIONS

1. *Local Anatomical Indications*

External auditory meatus wide and straight. Middle ear of large dimensions, well vascularized and resistant.

Medium pneumatization of the mastoid and preferably the wall of the zygoma should not pass beyond a vertical plane through the posterior border of the condyle of the mandible.

2. *Secondary Otospongiosis*

That is to say, progressive deafness with the same acoustic formulae that has been accompanied by inflammatory

alterations in the middle ear, either recently or in the past, characterized by redness of the drum or the handle of the malleus, deformation of the membrane, heavy adhesions, old or recent perforations, open or closed by a thin cicatrix. The inflammatory element starts up again after section of the head of the malleus, the lesions on the articular surfaces of the cartilage of the incus which necessitates the secondary ablation of this ossicle. Any damage of the tympanic substance or cicatrix can destroy the internal plastic flap with subsequent suppuration and necrosis of the incus.

3. *Poor General Health and Unsuitable Ages*

One can operate on patients between eighteen and fifty-five years of age. Younger patients are hard to manage and operation under local anesthesia is rendered impossible, as well as the postoperative dressing, by the turbulence and incooperation of the patient. Patients over the age of fifty-five tolerate the necessary analgesics and hemostats such as morphine, scopolamine, ephedrine, adrenalin with difficulty. Cardiovascular disorders are exacerbated by opening the labyrinth. But even before the age of fifty-five, obesity, alcoholism, cardiovascular, pulmonary, hepatic or renal afflictions are all absolute contra-indications for this type of surgery. All candidates for the operation should have a general complete physical and clinical examination.

4. *Local Anatomical Contra-Indications*

Narrow external auditory meatus—a crooked or flattened meatus. The length of the flap will be insufficient to close the attic and the aditus with subsequent danger of infection and suppuration of the middle ear.

Too extensive pneumatization of the mastoid, of the squamous portion of the temporal bone and especially of the root of the zygomata. All these cells must be opened and scraped of this epithelium to avoid secondary suppuration or one will have considerable bony destruction.

It is absolutely necessary before deciding on an intervention to take a stereoscopic radiogram of the ear in question and to interpret the films correctly. For the last two years all my patients have been systematically X-rayed stereoscopically by Doctors Dano and Lainè. Their precise technique has furnished very interesting radiograms and has permitted me to fix the operative indications with exactitude.

Operative Technique

Tympano-labyrinthopexy is performed in three principal stages separated by intervals of about four or five months.

The first two stages are devoted to the transformation of the tympanic system and the thorough modifications of the mastoid region.

The third stage consists in the establishment of the labyrinthine fistula at the level of the new tympanic system.

The operation is conducted in the following fashion:

First Stage:

This is performed entirely within the external canal. It consists of lifting the soft parts, thick cutaneous soft parts, fibrous bands and periosteum of the posterosuperior demi-circumference of two-thirds of the external auditory meatus. This is done through a postauricular incision or even by the external auditory meatus if it is sufficiently wide.

The post-operative care consists in obtaining on the surface from which the periosteum has been removed, a supple cicatrix, but resistant, without sebaceous glands. It takes six or eight weeks for this cicatrization to be complete.

Second Stage:

This is done almost entirely in the middle ear, making an incision through the previous post-auricular scar. One first separates the thin cicatrix made at the first operation from the post-superior canal wall. This cicatrix consists of new skin and scar tissue as well as the upper border of the drum. I have given it the name "internal plastic."

Then one resects the mastoid, opens the aditus and attic so as completely to exenterate the cell structure and show up the body of the incus and the head of the malleus. The joint which joins these two bones is opened and the two ossicles separated. Using a specially constructed snare, the head of the malleus is resected, care being taken not to puncture the membrana tympani or displace the incus, which should stay in high position and conserve its posterior and inferior articulations. The internal plastic (prepared flap) is then elevated and its bleeding surface applied to the incus, its internal surface to the attic, the aditus and even the antrum. The middle ear is thus hermetically sealed in its superior portion. One ends by covering the lower part of the mastoid with an external plastic made up of scraps of skin and muscle elevated from the inferior surface of the mastoid.

When, after epidermatization of the operative cavity (which in such cases as in wounds of radical operation usually takes six or eight weeks) one examines the transformed ear through the external auditory meatus, one finds that the external canal is considerably increased in size and communicates directly with the mastoid cavity. This large vestibule communicates *behind* on the curve of the horizontal semi-circular canal covered with a more or less thin cicatricial pedicle in front. It communicates with the modified tympanic system consisting now of the drum and the internal plastic which is continuous with its superior half circumference. This internal plastic over the incus, mobile on its posterior and inferior supports, ends on the surface of the horizontal semi-circular canal, which is just below and behind the incus.

Third or Labyrinthine Stage:

This consists in lifting up the endo-mastoid flap at the level of the external semi-circular canal, which is opened with great caution, so as not to injure the membranous canal. As soon as this opening is obtained, the increase in hearing seems considerable, ten, twenty times and even

more the pre-operative hearing distance. The cicatricial endomastoid flap produced at this level is put in place, consisting of the internal plastic, lowered from the superior border of the incus, which will from now on cover the labyrinthine fistula.

The hearing which ordinarily decreases in the days following the operation, increases as soon as cicatrization has taken place, and attains or even surpasses the hearing observed on the operating table, the moment the labyrinth is opened. It is now easy to observe with a manometer that a feeble air-pressure—from 2 to 10 cm. of water—in the external ear, determines a very definite horizontal nystagmus; at the same time the patient feels a more or less intense sensation of vertigo. Furthermore, one can observe with the tuning-fork the return of aerial hearing of low sounds (64 and even 32 double vibrations); the Weber is changed, lateralized from now on to the non-operated side, and the Rinne can become positive on the operated side while it remains negative on the opposite side.

In a great number of cases, unfortunately, the success is ephemeral: four, six, or ten weeks later, one sees the aerial hearing diminish, the Rinne becomes negative and the Weber indifferent. At the same time, the air pressure in the meatus can attain 40 and even 60 cm. of water without determining nystagmus, nor a sensation of vertigo. This is due to the fact that the labyrinthine fistula closes, due to the reconstitution of a rigid bony layer, which rarely attains the thickness of the primitive bony wall of the canal, and more often does not exceed a few tenths of a millimeter. It suffices, in a complementary operation, to extract this bony film, to see the hearing gain of the first operation return, and sometimes be even greatly increased. This time the result will be lasting, the regenerating process of the bone becoming gradually exhausted. In many cases, however, I had to open the labyrinth three times.

RESULTS

In 1935, at the time I published my Report to the Congress of Paris, my statistics were as follows:

Patients operated on.....	109
Number of operations performed..	325
Positive results	74 per cent
Composed as follows:	
Very good results, that is to say, ten times and more previous hearing distance	40 per cent
Good results, five to ten times previous hearing distance.....	14 per cent
Mediocre results, from two to five times previous hearing distance..	20 per cent
Fatalities	None
The number of patients now treated or under treatment exceeds.....	140
And the number of operations....	400

By utilizing my technique, the second method which I have just discussed, and a differential snare for the section of the head of the malleus (a happy modification of my previous snare created by one of my patients, barrister-at-law de Rienzi) I am now able to attain 80 per cent positive results, of which 60 per cent are superior by ten times to the pre-operative hearing distance.

I have had in mind, foremost, the creation of a surgical technique giving very important practical hearing results, and creating an impression on the patient and his immediate relations, but I hope that in the future a precise audiometric measurement will permit us further to improve the method and, especially, its indications and contra-indications.

CONCLUSIONS

The tympano-labyrinthopexy permits us to obtain, in cases of deafness from otosclerosis, a fearful and frequent disease, lasting results unknown up to the present time and absolutely comparable to those obtained in ophthal-

mology, in cataract and glaucoma. But, just as for cataract, before the intracapsular extraction of Barraquer, two operations were most often necessary, even so, in otosclerosis, one must, in the majority of cases open the labyrinth twice in order to obtain lasting results. We must still work to solve this problem of osteo-genesis, which will diminish not only the unpleasantness of re-opening the labyrinth, but one of the causes of grave failure: the injury of the membranous canal.

But must we, as long as we have not attained this result, consider this operative procedure as still being in an experimental period, and of an exceptional application? I do not believe so. During more than half a century, cataracts were operated by a two-stage method, before the extraction in a single stage operation. The case must be likewise in otosclerosis, as it is well worth doing a complementary operation rather than to leave the labyrinth irremediably impaired, inasmuch as, the greater the deafness, the poorer the results.

The tympano-labyrinthopexy is today a precise operation, the fundamental elements of which seem definite—that is, the decompression of the labyrinth and the reconstitution of a tympanic system. Personally, I have done these operations for years, I can say daily, at my Private Hospitals in Nantes. But we still have a great deal of work to do to adapt our theories to these first results, and to solve the new problems to which they give birth.

Gentlemen, I would like to be able to convince you that the moment has come to give to this surgical therapy a very large diffusion, because the number of patients who require this treatment is considerable, perhaps even millions. But the importance of the operations that must be performed, the complexity of the technique—in a word, its difficulty and the long and minute post-operative care required—does not permit one to undertake it without long preparation. To avoid failure, and the disrepute which has befallen the first attempts in the surgical therapy of deafness, we must envisage three facts:

1. *For the otologists:* There should be an organization of teams, truly and thoroughly specialized, instructed minutely and during a given length of time, sufficiently numerous to answer a great number of calls and avoid fatigue and hurry.

2. *For the patients:* It must be possible to hospitalize them the necessary time, in quarters specially chosen for them, far from the neighborhood of other suppurating diseases, acute or chronic, of the ear or the nose, and in a condition of mental and material hygiene that is necessary and suitable for patients who undergo labyrinth operations.

3. Lastly, *in order to realize further progress:* There must be an organization of laboratories, with adequate quarters and precise acoumetric apparatus.

Such a realization would make of otology a highly evolved specialty, perhaps even similar to ophthalmology, which has attained, in such a short space of time, a high degree of perfection. But, as I have said already, in Europe this cannot be the result of isolated efforts. In order to obtain the indispensable help of public and government authorities, one must first of all have the approbation and the moral help of an international committee of otosclerosis, which is the supreme judge in this matter, and the only one qualified to provoke the necessary decisions. I should be especially happy, if, in spite of the gaps and the imperfections of such a long and arid discourse, I have been able this evening to retain your kind attention on the real possibility, the unavoidable necessity, and the profoundly humane character of this great work that remains to be accomplished.